

lic intelligence, as e. g., thru the courses for workingmen; but here also he insisted upon thoroughness and genuineness on the part of the teachers. No one thing was more odious in his eyes than that popularization of science which is based upon mere appearance of scholarship.

The severe illness which first attacked him in 1867 was an important factor in determining the decrease of his activities during recent years. With a slow but not uncertain step it brought about the dissolution of the once tireless mind and body which in earlier years had delighted in activity. Early on the morning of July 12, 1877 a gentle and painless death freed this able man from his sufferings, and bore him from the midst of his large circle of friends, admirers, and relatives.

#### EXPLANATION OF THE TABLE OF EXCESSIVE PRECIPITATION.

The REVIEW publishes each month, in Table IV, a statement of the accumulated precipitation during storms of certain intensities. The actual fall during periods of five minutes, ten minutes, etc., is given, in the right hand columns of this table, for each five minute interval up to 50 minutes, inclusive. When the excessive rate is continuous for more than 50 minutes the accumulated precipitation for such longer periods is printed in the following line or lines, and the actual duration of the given amount is found by adding to the figures printed at the top of the column an additional 50 minutes for each additional line employed. The times of beginning and ending given in columns 5 and 6 of this table will show, in such cases, that the total period is a continuous period and that the depths given are the accumulated depths from the beginning of the excessive rate of fall. In the REVIEW for December, 1905, for example, on page 566, the excessive rate at Atlanta on the 2d was continuous from 6:46 p. m. to 9:13 p. m., and the depth of 1.35 inch given in the 5-minute column is not for 5 minutes, but for 55 minutes, and the depth of 2.20 in the 20-minute column of the line below is for the total period of 120 minutes. The case is similar for Jupiter on the same page. The storm of the 2d at New Orleans, La., is recorded on two horizontal lines, but the times are not continuous, and the amounts given on the second line correspond to the times printed at the top of the columns.

The above explanation is prompted by the fact that some confusion has resulted from a too literal interpretation of the explanatory heading of these right-hand columns.—F. O. S.

#### THE ATMOSPHERE AND THE SOIL.

The Department of Agriculture, thru its various bureaus, seeks to investigate every condition that can in any way affect the growth of the plant and the character, quality, or quantity of the resultant crop. We quote the following paragraphs from an address by Milton Whitney, Chief of the Bureau of Soils, published as *Farmers' Bulletin No. 257*, on "Soil Fertility". The greater part of the paper is given up to the question of manures and fertilizers, but the following paragraphs relate to atmospheric influences.

##### *Plants must breathe.*

Of course we all understand that the breathing of the plant is mainly thru its leaves; but the soil also may be a very important factor in the breathing of plants, as it is necessary to have a supply of oxygen around the roots. Physiologists differ as to the office the roots have in regard to the absorption of oxygen. Whether it is a true breathing—the taking of oxygen for the plant economy thru the roots as thru the leaves—has never been decided; but it is unquestionably a fact that roots of cultivated plants require oxygen around them for their healthy growth. We know perfectly well that cultivation of the soil is important or necessary for the best development of many crops, and we say that this is in order to introduce oxygen and make possible the introduction of more water into the soil.

The investigations of the Bureau of Soils seem to indicate that the actual supply of oxygen to the roots may not be the only or even the most important function of cultivation. It seems necessary not only to

introduce air into the soil, but, by stirring the soil, to permit the escape of noxious gases that are perhaps given off by the plants themselves, or produced by bacterial action on the remains or excreta of plants. In a crowded room a person begins to feel drowsy, languid, and his head begins to ache. We speak of these sensations, usually, as due to deficient ventilation, too little oxygen, the oxygen having been partly used up, and to an accumulation of carbonic-acid gas; but physiologists now believe that this is not the true explanation, but that the person suffers because there are gaseous emanations from the lungs that are deleterious to human beings. The plant is exceedingly sensitive to gases. On the streets of Washington one of the principal causes of the death of trees is leaks in gas pipes; every year hundreds and perhaps thousands of trees have to be removed, and the usual cause is a leaking gas pipe. The amount of gas is so small that it can not be detected by the odor, but the influence of the gas on the roots is so pronounced that the tree suffers and is likely to die. It seems probable that the ventilation of the soil is necessary not only to allow air to enter, but to allow gases formed in the soil to escape.

Furthermore, air must enter not only for the use of the root itself, but also to oxidize the organic matters given off by the plants—to preserve the proper sanitary conditions in the soil—as I shall explain later. Ventilation to remove noxious gases might increase the yield without affecting the fertility. Ventilation for the purpose of oxidizing organic matter might affect fertility itself.

#### THE CLASSIFICATION OF CLIMATES.

We call the attention of our readers to a most instructive series of articles by Prof. R. DeC. Ward, on "The classification of climates", published in the *Bulletin of the American Geographical Society*, for July and August, 1906. After explaining in detail the many classifications that have been suggested by various students, Professor Ward concludes as follows:

The broad classification of climates into the three general groups of marine, continental, and mountain, with the subordinate divisions of desert, littoral, and monsoon, is convenient for purposes of summarizing the interaction of the climatic elements under the controls of land, water, and altitude. But in any detailed study some scheme of classification is needed in which similar climates in different parts of the world are grouped together, and in which their geographic distribution receives particular consideration. It is obvious from the preceding paragraphs that an almost infinite number of classifications might be proposed; for we may take as the basis of subdivision either the special conditions of one climatic element, as, for example, the same mean annual temperature, or mean annual range of temperature, or the same rainfall, or rainy seasons, or humidity, and so on; or, again, similar conditions of the combination of two or more elements of climate may be made the basis of classification; or we may take a botanical or a zoological basis. Of the classifications which have been proposed, special reference is here made to those of Supan, Köppen, and Hult. That of Supan, taken as a whole, gives a rational, simple, and satisfactory scheme of grouping, whose frequent use in climatic descriptions would tend toward system, simplicity, and facility of comparison. It emphasizes the essentials of each climate, and serves to impress these essentials upon the mind by means of the compact, well-considered verbal summary which is given in the case of each province described. Obviously, no classification of climates which is at all complete can approach the simplicity of the ordinary classification of the zones.

Köppen's admirable scheme of subdividing climates from the botanical point of view is distinctly rather for the use of students of plant geography than of general climatology. The present limits of the different climates in Köppen's map will doubtless need to be changed in several cases, as more detailed botanical studies throw further light on the geographical distribution of different plants, and no rigid delimitation of plant zones is ever satisfactory to everyone. But Köppen's classification has the great merit of recognizing the existing differences of climate between east and west coasts, and between coasts and interiors. The coordination of districts of vegetation and of climate, which this scheme so strikingly emphasizes, is a noteworthy fact in climatology.

Hult's classification is far too detailed, if all the smaller provinces are taken into account; but if only the larger kingdoms are considered, as in Plate II [not reproduced], the scheme is useful. It, however, possesses no advantages over that of Supan, which takes account of more typical characteristics of climate. Ravenstein's hygrothermal types rest upon unsatisfactory data, and regions of very different climatic conditions are grouped together because they happen to have the same mean annual temperature and relative humidity.

#### THE WEST INDIAN HURRICANES OF SEPTEMBER, 1906.

By E. B. GARRIOTT, Professor of Meteorology.

Tropical storm development was exceptionally active in American waters during September, 1906. In seeking the causes of